

EDITORIAL

Reconstruction After Total Gastrectomy: What Is Preferred Technique?

WALTER LAWRENCE, JR, MD

From the Surgical Oncology Division, Massey Cancer Center, Virginia Commonwealth University, Richmond, Virginia

Reconstruction of the gastrointestinal tract after total gastrectomy for cancer has received considerable attention over the years. Methods employed for reconstruction have ranged from simple to complex techniques, but all methods have been difficult to assess due to great individual variability in response to food intake after these major alterations in upper gastrointestinal anatomy. Concerns that have affected the design of reconstructive operations include the role of a reconstituted reservoir to replace the missing stomach, the possible importance of duodenal passage of foodstuff (rather than bypassing the duodenum as occurs with the Roux-en-y technique), and the development of mechanisms for slowing intestinal transit. Until recently, most surgeons have developed a preference for one method of reconstruction or another, often based on assumptions regarding the relative importance of the individual concerns listed above as well as on the relative simplicity of the reconstruction. Fortunately, scientific data from clinical trials that will answer some of the questions and concerns regarding postgastrectomy reconstruction have recently been published.

It should be stated at the outset that the major concern relating to reconstruction after total gastrectomy relates to the integrity of the esophageal anastomosis. The chances for anastomotic leakage, with associated morbidity and occasional mortality, are significantly greater with esophageal anastomoses than with anastomoses between portions of the gastrointestinal tract that have a serosal covering. Great care must be taken to avoid such leakage. The esophageal anastomosis can be accomplished by either a suture technique or by a stapling device, but attention to detail and precision in performance of the anastomosis are crucial to the avoidance of life-threatening early complications [1]. However, the focus of this discussion is on later "problems" associated with reconstruction after total gastrectomy, primarily nutritional state and the quality of life issues that are affected by aspects of the reconstruction other than the esophageal anastomosis itself.

Reconstruction after total gastrectomy initially employed a simple approach involving correction of the operative defect by either esophagojejunostomy or esophagoduodenostomy, the former being the most commonly employed due to the greater ease of approximating the esophagus and the jejunum (Fig. 1). Malnutrition after initial recovery from the operative procedure was a frequent accompaniment of total gastrectomy when such simple reconstructive procedures were employed. Actually, this was the major stimulus for developing other, often more complex, means of reconstruction (Figs. 2 and 3), these being either interposed bowel segments or a jejunal reservoir [2].

The initial concept of the mechanism for postgastrectomy malnutrition was a deficiency of digestive enzymes, an idea that developed on the basis of the fat malabsorption observed following total gastrectomy. However, the severity of fat malabsorption after total gastrectomy was far less than that associated with major small bowel resection and various malabsorption syndromes (Fig. 4), and little if any correlation could be demonstrated between the severity of the weight maintenance problems and the degree of malabsorption that could be detected on laboratory studies (Fig. 5) [3]. Also, improvement in the ability of the patient to absorb fat was noted over time (Fig. 6) and the relatively small deficiency in fat absorption could be "corrected" by feeding dilute hydrochloric acid immediately prior to meals, to stimulate secretin [4]. These latter two observations, along with continued problems with weight maintenance, led to the conclusion that malabsorption was *not* a major factor in postgastrectomy malnutrition. Dietary histories demonstrated that *total* nutritional intake was the major causative factor.

Accepted for publication July 2, 1996.

Address reprint requests to Walter Lawrence, Jr., MD., who is now at the Division of Surgical Oncology, Medical College of Virginia, P.O. Box 11, Richmond, VA 23289.

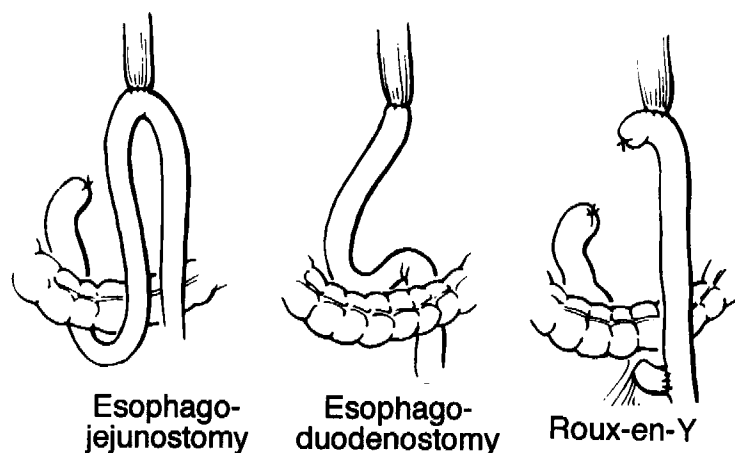


Fig. 1. Diagrams demonstrating simple means of reconstructing the intestinal tract after total gastrectomy (from Lawrence [2]).

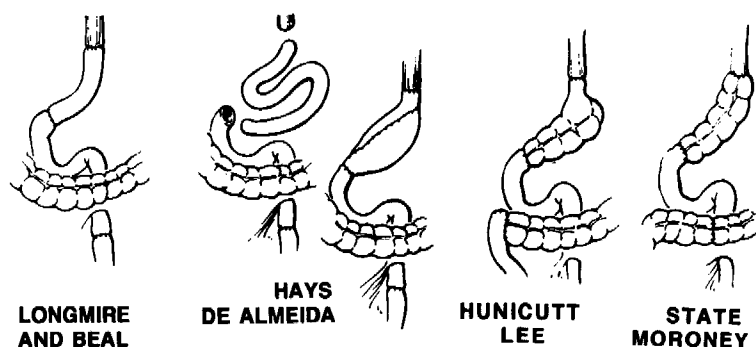


Fig. 2. Various transpositions of jejunum or colon for gastric replacement after total gastrectomy (from Lawrence [2]).

This decrease in total nutritional intake, in turn, had a direct relationship to the severity of postprandial symptoms in these patients.

Since postgastrectomy malnutrition and "quality of life," as manifested by decreased food capacity, postprandial unpleasant symptoms, and problems in body weight maintenance, seemed to be related in some way both to the absence of the stomach and a potentially faulty reconstruction, new, more complex ideas for reconstruction were developed. The goal of all these efforts was to increase total nutritional intake by both increasing capacity and decreasing post-prandial symptoms, thereby leading to better weight maintenance overall.

KEY QUESTIONS REGARDING POSSIBLE RECONSTRUCTIONS

Several broad questions have developed regarding the actual technique of reconstruction: (1) is a jejunal reservoir substitute for the missing stomach useful in achieving increased total food intake, (2) is "duodenal passage" of

foodstuff preferable to bypass of the duodenum by a Roux-en-y anastomosis, and (3) do any of these reconstruction procedures delay transit of foodstuff in such a way that they thereby reduce the so-called dumping symptoms? Until recently, most surgeons presumed they knew the correct answers to these questions and based their choice of reconstructive approach on these assumptions. They might favor a jejunal reservoir, or they might reject this approach as a nonbeneficial addition. They might route the foodstuff through the duodenum, often with a jejunal reservoir segment, or alternatively, use a Roux-en-y reconstruction in which the duodenum is bypassed (Fig. 7) [5]. Also, the transit in the small bowel may be modified by the Roux-en-y anastomosis itself. The marked variability in nutritional response of individual patients and the relatively small series of total gastrectomy patients that were studied made definitive answers to the above questions difficult to obtain. In the last several years, however, prospective randomized trials have addressed these questions and it would appear that

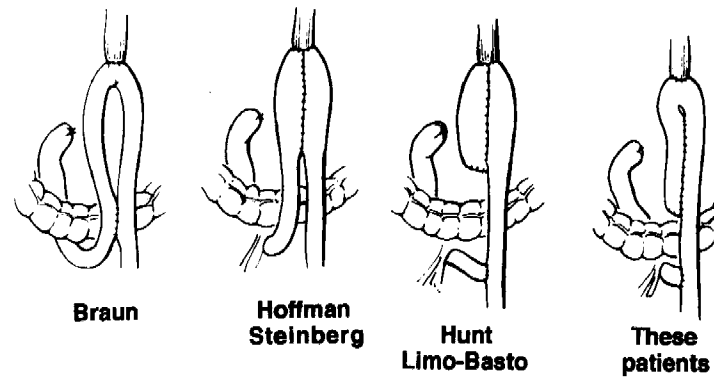


Fig. 3. Diagrams of simple methods for construction of a jejunal reservoir after total gastrectomy. The last diagram demonstrates the operation preferred by the author, an operation preserving blood supply to jejunum at site of esophageal anastomosis (from Lawrence [2]).

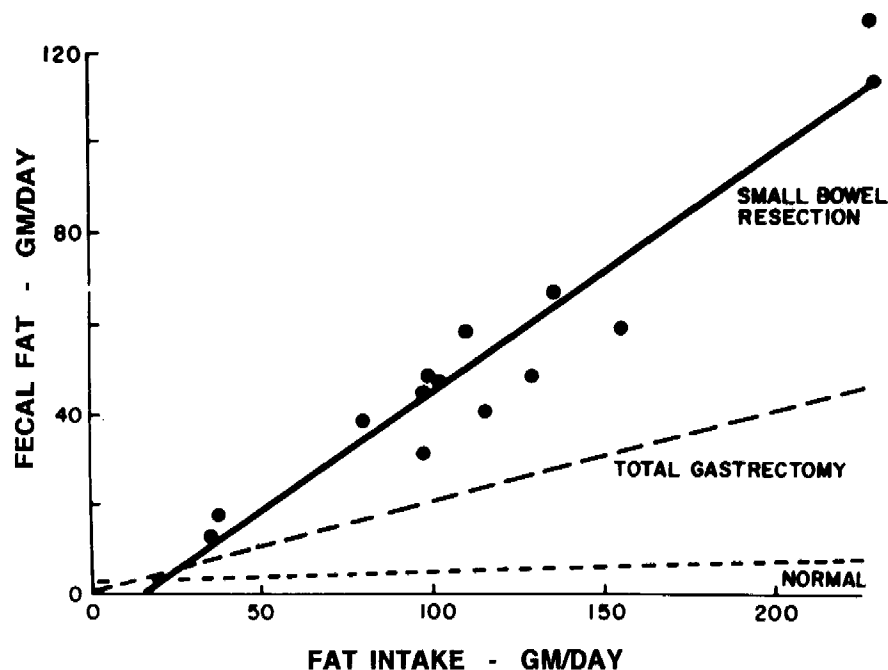


Fig. 4. The defect in fat absorption after total gastrectomy is contrasted with the greater defect noted after major (>70%) small bowel resection.

the preferred method of reconstruction after total gastrectomy now can be defined on a more scientific basis.

IS A RESERVOIR A SIGNIFICANT ADDITION TO RECONSTRUCTION AFTER TOTAL GASTRECTOMY?

The first clinical trial that objectively addressed this question was a 1987 randomized study by Troidl et al. [6] comparing simple esophagojejunostomy, with enter-enterostomy between the two jejunal loops, to a double lumen jejunal pouch proximal to a Roux-en-y anastomosis (Fig. 8). Evaluation of postprandial symptoms and evaluation of weight maintenance following gastrectomy both showed benefit in favor of the pouch and Roux-en-y

anastomosis. Whether this observed benefit can be attributed totally to the jejunal reservoir or not might be considered presumptuous since the Roux-en-y anastomosis could delay intestinal transit significantly and thus be the major explanation for the superiority of results in this pouch group. A subsequent nonrandomized study of 104 subjects by Buhl et al. [7] specifically assessed the role of the jejunal pouch (Fig. 9). All patients in this study had a Roux-en-y anastomosis (and bypass of the duodenum), and the group with a double lumen jejunal pouch clearly did better nutritionally than the group without a pouch. The creation of a pouch from the jejunum gave nutritional results that were quite similar to those obtained with another group of concurrent patients who had only

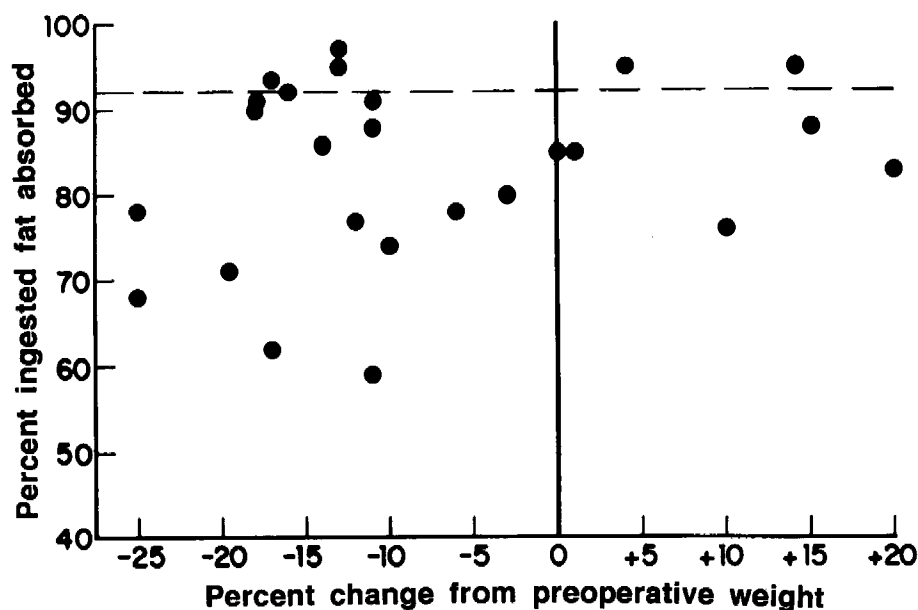


Fig. 5. Relationship between fat absorption (as percent of intake) and body weight (as percent of preoperative weight). Summary of 26 studies in 21 patients after total gastrectomy (from Lawrence et al. [3]).

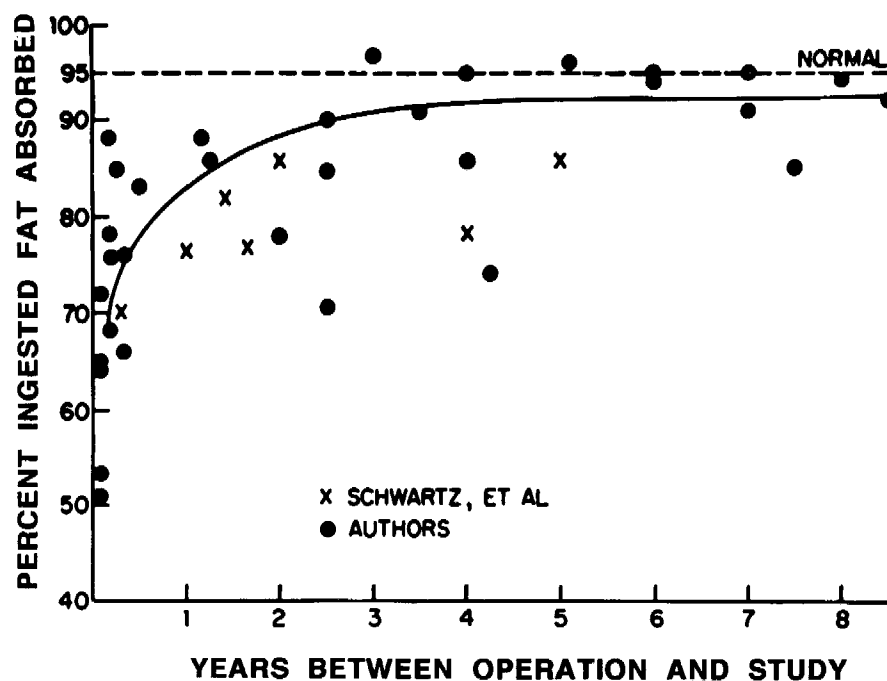


Fig. 6. Fat absorption with time after total gastrectomy in 14 patients in this study.

distal partial gastrectomy. These data gave further support to the benefit of a jejunal pouch as part of the reconstruction.

IS "DUODENAL PASSAGE" IMPORTANT?

A recent study by Nakane et al. [8] addressed the possible increased or decreased benefit of reconstruction

by Roux-en-y anastomosis by randomizing jejunal pouch reconstructions by this route versus the same pouch using "duodenal passage" instead (Fig. 10). A third experimental group had a Roux-en-y anastomosis without a jejunal pouch and served as an additional control. In this study the patients with the pouch and the Roux-en-y anastomosis achieved greater food intake and greater weight recovery

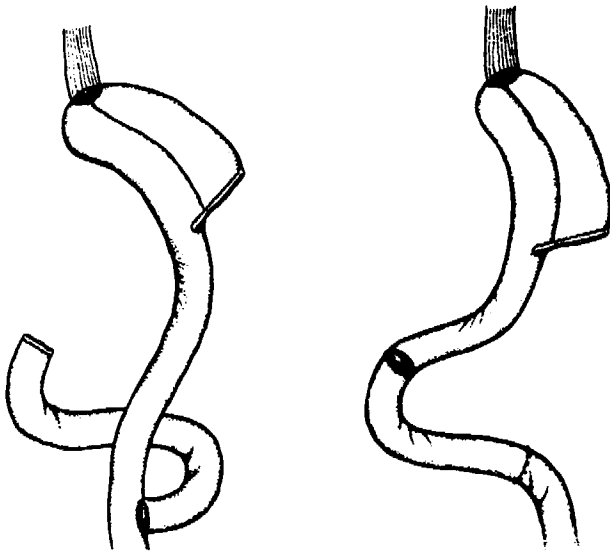


Fig. 7. Comparison of jejunal pouch interposed between esophagus and duodenum, or with Roux-en-y reconstruction (from Fuchs et al. [5]).

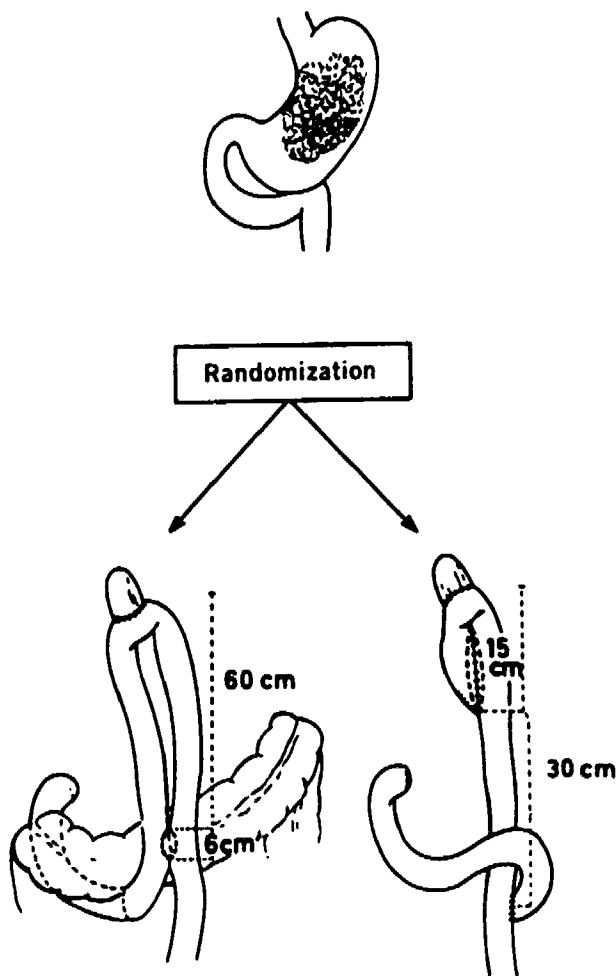


Fig. 8. Operative design of randomized trial comparing esophagojejunostomy with pouch-Roux-en-y reconstruction (from Troidl et al. [6]).

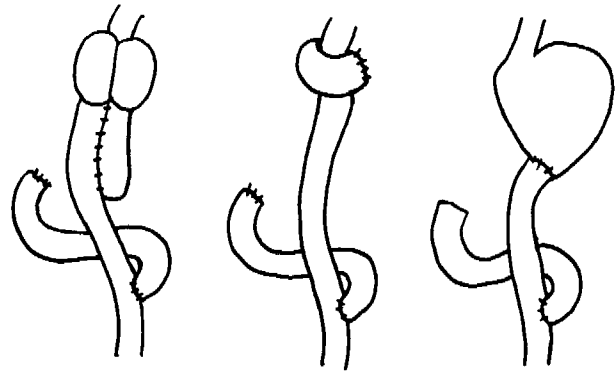


Fig. 9. The three groups in this study: Roux-en-y anastomosis with or without jejunal pouch, or distal partial gastrectomy with Roux-en-y anastomosis (from Buhl et al. [7]).

than the other experimental groups, thereby appearing to confirm the superiority of the pouch and Roux-en-y combination over other methods of reconstruction.

HOW ABOUT DELAY IN TRANSIT OF FOODSTUFF?

Is there a reason why reconstruction after total gastrectomy by jejunal pouch with Roux-en-y anastomosis should give better simulation of normal gastric function than other reconstructive methods? A long-standing possible explanation has been that the jejunal pouch can function effectively as a reservoir if there is a pseudopyloric function introduced by using the Roux-en-y anastomosis. Initial evidence for this anastomosis functioning in this fashion came from postsurgical radiologic studies described in the 1950s by Dr. Limb-Basto of Portugal [9]. Whether the delay in transit following barium-impregnated meals he demonstrated was due to transection of the circular muscle of the jejunum, or to partial obstruction at the anastomotic site was unclear. However, a significant reduction in motility has been demonstrated in the human jejunum after a double lumen jejunal pouch has been created, when compared to a simple efferent jejunal limb serving as reconstruction after total gastrectomy [10]. It would appear from this study that the rate of transit in the region of the jejunal pouch may be slowed enough to contribute to the desired storage function without relying on the concept of a pseudopylorus advanced by Limb-Basto [9]. However, the recent randomized trial by Fuchs et al. [5] that compared results following duodenal passage of foodstuff, as opposed to Roux-en-y anastomosis, actually showed no difference in these two groups in either unpleasant symptoms or weight maintenance problems. These findings are in contrast to the data in the Nakane study [8] favoring Roux-en-y anastomosis over "duodenal passage." The jejunal pouch itself actually may be a more important factor, in functional terms, than the Roux-en-y type reconstruction when it

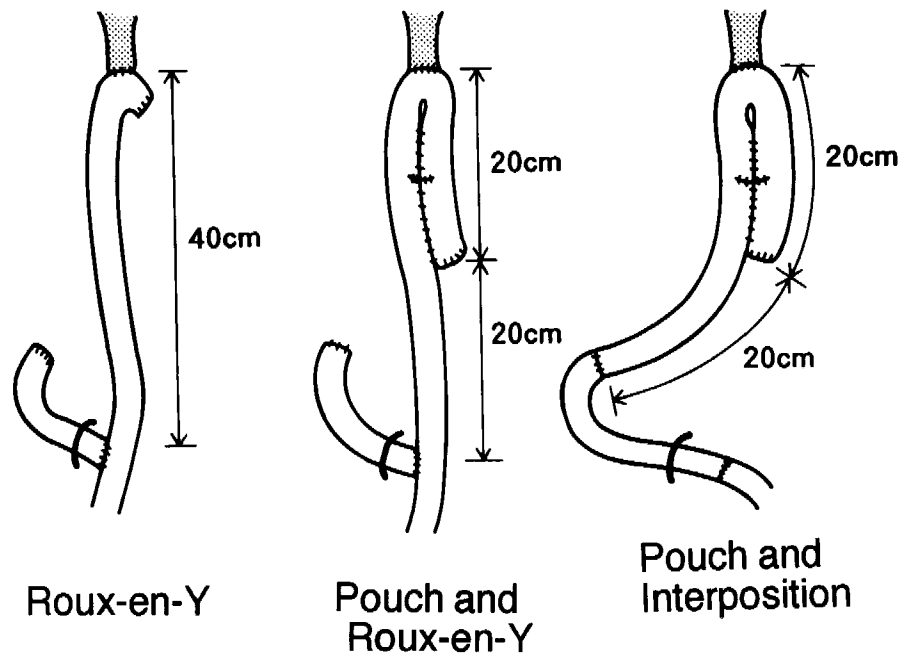


Fig. 10. This randomized trial compared simple Roux-en-y reconstruction with pouch by either Roux-en-y or by interposition (from Nakane et al. [8]).

comes to beneficial delay in transit and reservoir function.

CONCLUSIONS

From the data collected thus far, it appears that a jejunal pouch with distal Roux-en-y anastomosis after total gastrectomy actually is superior to reconstruction without a pouch for a reservoir. This approach is also probably superior to using the same type of pouch via the duodenal route (rather than the Roux-en-y anastomosis), but clinical trial data results are somewhat conflicting on this point. Last but not least, the type of reconstruction supported by these clinical data is both easily and rapidly constructed by either suture or stapling techniques. After years of preferring this approach of jejunal pouch with Roux-y anastomosis [2], on clinical grounds, the author is pleased that there are now clinical trial data to support this approach.

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